UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION,
PESTICIDES AND
TOXIC
SUBSTANCES

August 29, 2001

MEMORANDUM

SUBJECT: Initial Tart Cherry Benefits Assessment for Azinphos-methyl and Phosmet

FROM: Donald W. Atwood, Entomologist
Herbicide and Insecticide Branch
Biological and Economic Analysis Division (7503C)

Jihad Alsadek, Economist
Economic Analysis Branch
Biological and Economic Analysis Division (7503C)

THROUGH: David Brassard, Senior Entomologist
Jonathan Becker, Acting Chief
Herbicide and Insecticide Branch
Biological and Economic Analysis Division (7503C)

Arthur Grube, Senior Economist
David Widawsky, Acting Chief
Economic Analysis Branch
Biological and Economic Analysis Division (7503C)

TO: Diane Isbell, Chemical Review Manager
Veronique LaCapra, Chemical Review Manager
Margaret Rice, Chief
Reregistration Branch 2
Special Review and Registration Division (7508C)

CC: Denise Keehner, Director
Biological and Economic Analysis Division (7503C)

SUMMARY

There should be negligible impact on tart cherry production from extension of the REI. First, tart cherries are not hand thinned (i.e., rely on natural fruit set). Second, tart cherries are mechanically harvested which would limit potential exposure. Third, tart cherries are not propped during production. However, extension of the REI beyond the current label may cause some producers to switch to a product with a lesser REI for late season pest control. This is particularly important in relation to the zero pest tolerance for fruit flies associated with tart cherry marketing and the lack of alternative insecticides which are efficacious against this pest.

BACKGROUND

Cherries occupy the *Cerasus* subgenus within *Prunus*, being fairly distinct from plums, apricots, peaches, and almonds. They are members of the *Rosaceae* family, subfamily *Prunoideae*. *Prunus cerasus* L. is the sour cherry. As a group, cherries are relatively diverse and broadly distributed around the world, being found in Asia, Europe, and North America. While sweet cherries are virtually all *P. avium*, the term sour cherry may include hybrids between *P. avium* and *P. cerasus* (referred to as "Duke cherries"), ground cherry, and hybrids of ground cherry with *P. cerasus* (Marks Fruit Page, University of Georgia, http://www.uga.edu/hortcrop/rieger/index.html#Crops).

There is good evidence suggesting that *P. cerasus* arose from an unreduced pollen grain of *P. avium* crossed with *P. fruticosa*; this occurred in the same geographic region as for sweet cherry. The sour cherry came to the U.S. with English settlers, like sweet cherries. It is more tolerant of the humid, rainy eastern conditions, and therefore proliferated in the east more than sweet cherries, where they are is still cultivated today in greatest numbers. Sour cherries do not attain good size when grown in arid climates. Sour cherries are also called "pie" or "tart" cherries. Most sour cherries are processed into pie fillings, hence the name (Marks Fruit Page, University of Georgia, http://www.uga.edu/hortcrop/rieger/index.html#Crops).

Sour cherry cultivars are divided into 2 groups: 1) Amarelles - Upright, vigorous trees; pale colored fruit, or reddish, with light-colored or clear juice, low acid [Montmorency, Kentish, Early Richmond], and 2) Morellos - Small, bushy, compact trees; dark red fruit, more spherical, higher acid, red colored juice [Stockton, Vladmir, North Star](Marks Fruit Page, University of Georgia, http://www.uga.edu/hortcrop/rieger/index.html#Crops).

Cherries grow best on deep, silt loam soils with good internal drainage. Cherries are self-fruitful and planted in solid blocks. Growers establish sod row middles in the orchards to facilitate use of equipment, reduce erosion, and to prevent pest build up. A bare area is maintained under the tree rows with herbicides. Virtually all tart cherries are mechanically harvested in the U.S. Growers harvest tart cherries from late June through July using mechanical harvesters to shake the cherries from the trees. They transport the cherries to the processing plants in bins of ice water. Growth regulators are used in tart cherry production. Gibberellic acid (ProGibb) is used to delay flowering in first year trees and increase fruiting capacity and reducing blind wood. Ethephon (Ethrel) is used to loosen fruit for mechanical harvesting (Crop Profile for Cherries (Tart) in Pennsylvania, 2000 and Crop Profile: Cherries in New York, 2000).

Tart cherries are produced in primarily in 6 states; MI, NY, WI, OR, UT and PA (Agricultural Statistics 2000, USDA/NASS). In 2000, tart cherries were reportedly grown on 46,800 U.S. acres. Production regions and crop values are listed in Table 1.

Table 1. Tart cherry production (1998 and 1999) and crop value (1998).

State	1999 Production		1998 Production		1998 Crop Value	
	million pounds	% total production	million pounds	% total production	cents per pound	total value million ($)
MI	185.0	72.5%	263.0	75.6%	0.14	36.82
NY	17.5	6.9%	14.0	4.0%	0.18	2.52
UT	15.0	5.9%	33.0	9.5%	0.16	5.28
WA	14.5	5.7%	14.0	4.0%	0.12	1.68
WI	10.0	3.9%	15.8	4.5%	0.151	2.39
PA	7.2	2.8%	4.2	1.2%	0.19	0.80
OR	5.3	2.1%	2.8	0.8%	0.127	0.36
CO	0.6	0.2%	1.3	0.4%	0.448	0.58

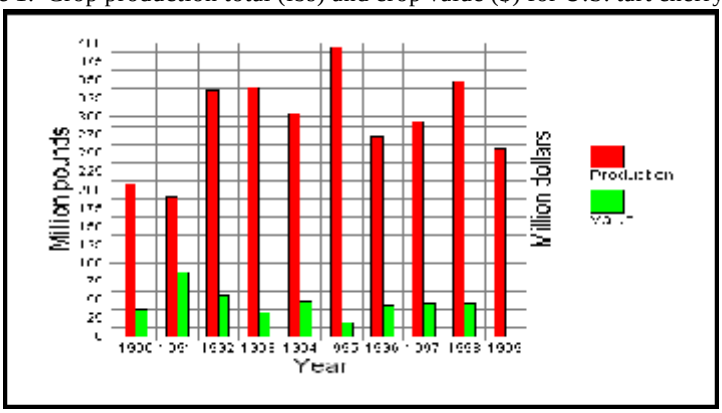
Total	255.3		348.1			50.42

Agricultural Statistics 2000, USDA/NASS and Agricultural Chemical Usage 1999 Fruit and Nut Summary, USDA/NASS

Total production in the U.S. in 1999 was 255,300,000 lbs. (Agricultural Chemical Usage 1999 Fruit and Nut Summary, USDA/NASS). While tart cherry production can be classified in an Eastern and a Western region, azinphos-methyl and phosmet use were only noted for the Eastern Region (MI, PA, NY, WI) in 1999 (Agricultural Chemical Usage 1999 Fruit and Nut Summary, USDA/NASS).

Figure 1 illustrates national crop production and crop value for tart cherries over the last 9 years. Overall, production has increased by approximately 30% since 1991 and 1992. However, great variability has occurred in both production and crop value. However, the general trend suggests a revenue drop when supply is high.

Figure 1. Crop production total (lbs) and crop value ($) for U.S. tart cherry production from 1990 to 1999.



Agricultural Statistics 2000, USDA/NASS

USE OF AZINPHOS-METHYL AND PHOSMET ON TART CHERRIES

Azinphos-methyl: - Azinphos-methyl was applied to 77% of tart cherry acres in the U.S. during 1999. There was, on average, 2.6 applications at a rate of 0.46 lbs. a.i./acre/application for the U.S. (3 lb. a.i./acre/year labeled maximum rate). Azinphos-methyl use on tart cherries was only reported for the Eastern U.S. (Agricultural Chemical Usage 1999 Fruit and Nut Summary, USDA/NASS). Use data for azinphos-methyl in the Eastern region is provided in Table 2.

Table 2. Percent tart cherry acreage treated with azinphos-methyl in 1999 for the Eastern production region.

State	Bearing Acreage	Percent Crop Treated
Michigan	28,100	84
New York	2,600	0
Pennsylvania	1,200	89

Agricultural Chemical Usage 2000 Fruit and Nut Summary, USDA/NASS

Phosmet: - An average of 67% of U.S. tart cherry acreage is treated annually with phosmet. There was, on average, 1.7 applications at a rate of 0.91 lbs. a.i./acre/application for the U.S. (1.75 lb. a.i./acre/year labeled maximum rate). Phosmet use on tart cherries was only reported for the Eastern U.S. (Agricultural Chemical Usage 1999 Fruit and Nut Summary, USDA/NASS). Use data for phosmet in the Eastern region is provided in Table 3.

Table 3. Percent tart cherry acreage treated with phosmet in 1999 for the Eastern production region.

State	Bearing Acreage	Percent Crop Treated
Michigan	28,100	69
New York	2,600	60
Pennsylvania	1,200	0

Agricultural Chemical Usage 2000 Fruit and Nut Summary, USDA/NASS

Target Pests: - Azinphos-methyl and phosmet are typically used to control cherry fruit fly, black cherry fruit fly and plum curculio. Azinphos-methyl and phosmet are applied after adult cherry fruit flies emerge in mid to late June and continue until fruit is picked in July. The first spray for plum curculio occurs immediately following petal fall. There is a zero tolerance for both these pests mandated by federal law and by the market place.

Cherry fruit fly and Black cherry fruit fly

The cherry fruit fly causes direct damage to fruit from feeding by the adults and larvae (Cherry Fruit Fly Fruit IPM Fact Sheet, Michigan State University, 1993). Little damage results from the egg puncture itself but a dimple will form around the puncture if fruit is stung while still green (Crop Profile for Cherries in New York). Primary damage results from larval feeding within the fruit. Infested fruits appear normal until the maggot is nearly grown, at which time a sunken spot appears. Larvae and their frass within the fruit render the product unsalable. Damaged fruit is more susceptible to disease (Cherry Fruit Fly Fruit IPM Fact Sheet, Michigan State University, 1993).

Peak emergence for the black cherry fruit fly is mid-June while peak emergence of the cherry fruit fly is about harvest (mid to late July). Both flies must be controlled within the eight day pre-oviposition period before the female matures and she can lay eggs (Cherry Fruit Fly Fruit IPM Fact Sheet, Michigan State University, 1993).

Plum curculio

Plum curculio can cause damage in two ways. First, wounds which result from feeding and egg laying by the overwintering beetles in the spring appear as crescent-shaped scars (oviposition injury) on the fruit or as bumps (feeding injury) that protrude from the fruit at harvest. Damaged fruit may be knobby, gnarled and scarred at harvest. Second, damage results from burrowing of the larvae inside the fruit. Premature fruit drop may be the result of larval activity within the fruit or adult feeding (Plum curculio Fruit IPM Fact Sheet, 1998, Michigan State University). Sprays for the plum curculio should be initiated at petal fall with the initial application followed by two or three sprays at 10-day intervals (Plum curculio, 1997, Georgia IPM).

Alternative Pest Control Methods: Several alternative pesticides are available to control cherry fruit flies and plum curculio in tart cherries. However, azinphos-methyl and phosmet are the most efficacious insecticides for controlling both of these pests (Tart Cherry Pest Management in the Future: Development of a Strategic Plan, 2000).

Malathion can be effective against cherry fruit fly when the ULV formulation is used. However, the ULV formulation of malathion is rarely used as it is applied by aerial application and aerial applications are rarely used in cherry orchards. Malathion is not effective for the plum curculio (Tart Cherry Pest Management in the Future: Development of a Strategic Plan, 2000).

Chlorpyrifos is not effective in controlling cherry fruit fly but can be used early season to control plum curculio. Chlorpyrifos is not as effective as either azinphos-methyl or phosmet against plum curculio but it is better than other alternatives (Tart Cherry Pest Management in the Future: Development of a Strategic Plan, 2000).

Carbaryl is effective in controlling the cherry fruit fly but is ineffective against plum curculio. However, due to the short residual activity for carbaryl, more frequent sprays are required when targeting cherry fruit flies, making control more expensive. In addition, carbaryl is disruptive to beneficial mites (i.e. causes flare up of spider mite populations) and established IPM programs (Tart Cherry Pest Management in the Future: Development of a Strategic Plan).

There are no other alternative insecticides, either currently registered or in the pipeline which are efficacious enough to meet the zero tolerance requirements for these pests on tart cherries.

There are no cultural practices which can control these pests as a stand-alone option. However, orchard monitoring programs have significantly reduced OP applications through border row spraying and alternate row spraying as opposed to entire orchard application. Orchard sanitation can help reduce pest densities. Ethephon can be used as a loosener to help harvest a high percentage of the fruit and limit residual crop for post-harvest pest production. Similarly, removal of alternate host plants, including abandoned orchards, can reduce pest densities (Tart Cherry Pest Management in the Future: Development of a Strategic Plan).

No effective biological control options are available for either pest at this time (Tart Cherry Pest Management in the Future: Development of a Strategic Plan).

Restricted Entry Intervals

Azinphos-methyl:

Current label REIs	REI= 14 days hand harvest / hand thin* 2 or 3 days for all other activities.
PHI	15 days

* Propping and hand thinning are not performed in the production of tart cherries.

Phosmet:

Current label REIs	REI= 24 hours for all activities (5 days for all activities in CA)
Registrant proposed REI	14 days for hand harvesting
PHI	7 days

* Propping and hand thinning are not performed in the production of tart cherries.

Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical.

IMPACTS ON CROP PRODUCTION*:*

Azinphos-Methyl: There should be negligible impact on tart cherry production from extension of the REI for the following reasons. First, tart cherries are not hand thinned (i.e., rely on natural fruit set). Second, tart cherries are mechanically harvested which would limit potential exposure. Third, tart cherry limbs are not propped during production. However, extension of the REI beyond the current labeled PHI would generally cause producers to switch to a product with a lesser REI for late season pest control. This is particularly important in relation to the zero pest tolerance associated with tart cherry marketing and more so given the lack of alternative insecticides which are efficacious against this pest.

Phosmet: There should be negligible impact on tart cherry production from extension of the REI. First, tart cherries are not hand thinned (i.e., rely on natural fruit set). Second, tart cherries are mechanically harvested which would limit potential exposure. Third, tart cherries are not propped during production. However, extension of the REI beyond the current label may cause some producers to switch to a product with a lesser REI for late season pest control. This is particularly important in relation to the zero pest tolerance associated with tart cherry marketing and more so given the lack of alternative insecticides which are efficacious against this pest.

References

Marks Fruit Page, Dept. of Horticulture, University of Georgia, http://www.uga.edu/hortcrop/rieger/index.html#Crops

Crop Profile for Cherries (Tart) in Pennsylvania, 2000, USDA.

Crop Profile: Cherries in New York, 2000, USDA.

Agricultural Statistics 2000, USDA/NASS.

Agricultural Chemical Usage 1999 Fruit and Nut Summary, USDA/NASS.

Tart Cherry Pest Management in the Future: Development of a Strategic Plan, 2000

Cherry Fruit Fly Fruit IPM Fact Sheet, 1993, Michigan State University,
http://www.msue.msu.edu/vanburen/fcfly.htm

Plum curculio Fruit IPM Fact Sheet, 1998, Michigan State University,
http://www.msue.msu.edu/vanburen/plumcurc.htm

Plum curculio, 1997, Georgia IPM, http://www.bugwood.caes.uga.edu/factsheets/99-004.html